

Valve Servicing *in* **ALL FORD-BUILT MOTORS**

Compiled and Published by the manufacturers of

K-D TOOLS

K-D Manufacturing Co. Lancaster, Pa. U.S.A.

INDEX

	Page
Dismantling the Engine	1
The Ford Valve Assembly	1, 2
Removing the Valve Assemblies	2
Ford V-8 Motors (except 150 h.p.), Mercury, Lincoln-Zephyr, Lincoln (to 1948), Ford 6 cyl. (to 1948), Tractor (to 1948)	3
Ford 6 and Tractor after 1948	4, 5
1949 Lincoln, 150 h.p. Ford Truck	5
Ford V-8-60	7
Ford V-8-85, Models of 1932 and 1935	9
Optional Servicing Individual Valves ('49 Ford, Mercury)	10
Dismantling the Valve Assembly	11
Grinding Valves	12
Free Type Valves in 150 h.p. Ford Trucks	14, 15, 16
Valve Keeper Inserters	16
Valve Stem to Tappet Clearance	17
Replacing Valve Assemblies	18
Ford V8, Mercury Motors	18
Lincoln-Zephyr, Ford 6 cyl. to '48, Ford 4 cyl., & Tractor (to '49)	19
Ford V-8-60	20
Reassembling the Engine	21
Gaskets	22
Cylinder Head Nuts, order for tightening	22, 23
Head Nut Pressures	23
Valve Timing	
Gear Marks, How to Check	23, 24
INSTRUCTIONS FOR USING K-D TOOLS	
No. 5D—Four-in-one Screwdriver	28
No. 10K Pliers Kit	27
No. 20 Ratchet Wrench Set	28
No. 30 Socket Screw Key Set	28
No. 77 Fan Belt Flipper	24
No. 99 Convertible Hacksaw Frame	29
No. 115 Ignition Point Aligning Tool	26
Nos. 119, 120 Ignition Kits	27, 26
No. 245, 250 Bar Type Valve Spring Lifters	18
No. 260 Bar Type Valve Spring Lifter	9, 20
No. 503 Vacuum Valve Grinder	14
Nos. 504, 507, 509 Vacuum Valve Grinding Adaptors	13, 14
Nos. 608, 609 Valve Keeper Inserters	7, 16, 17
Nos. 617, 618 Piston Pin Inserters	24
No. 700 Valve Spring Lifter	5
No. 818 Valve Guide Driver	10
No. 860 Valve Guide Puller Set	7, 8, 9
No. 865 Vacuum Valve Grinder	14
No. 800 Wheel Puller Set	25
No. 870 Piston Ring Filer	26
No. 875 Piston Ringer	25
No. 920 Valve Guide Puller Set	3, 4
Nos. 921, 922 Replacement Valve Guide Retainers	20
No. 923 Adaptor (920 Set for Ford 6 cyl.)	4
No. 925 Valve Guide Replacing Tool	19
Nos. 930, 935 Valve Spring Compressors	5, 6
Servicing individual valves	10, 11
Dismantling and reassembling valves	11, 12
Servicing Free-Type valves	15, 16
Nos. 1118, 1120, 1160 Valve Grinding Bushings	13
No. 1500 Tire Probing Tool	29

DISMANTLING THE ENGINE

All Ford-built V-type Engines to date

After draining the radiator, disconnect the fuel pump. Remove the valley cover and with it the carburetor and generator. This assembly is lifted off as a unit without removing the carburetor or generator from the cover. Remove all cylinder head nuts and the cylinder heads.

In-Line Engines (Ford 4 cyl., Ford 6 cyl., and Ford Tractor).

Drain radiator and proceed as with any conventional in-line engine.

THE FORD VALVE ASSEMBLY

The design of the valve assemblies used in motors built by Ford beginning in 1934 incorporates two retainers; one at the lower end of the valve stem to hold the valve-spring-guide assembly together and one which fits into a milled slot in the guides to hold the assembly in place in the guide bore. Figures 1 and 1A. The spring pressure causes the guide retainer (the upper one) to

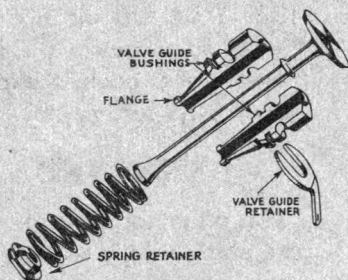


FIGURE 1

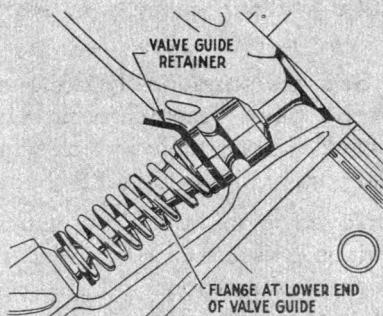


FIGURE 1A

bear in a machined counterbore (about 1/16") in the block, thereby holding the assembly in place. The assembly is put together on the bench and dropped into the guide bore as a unit, after which the guides are pulled down and the retainer is put in place. The guides

have a shoulder cast on them at the bottom to provide a hold for pulling the guides down for installing guide retainers. All this is explained in a later part of this book. In late motors, intake valves are identified by the letter "R" on the head; exhaust valves by the letter "F." Valves marked "R" must **not** be used in exhaust ports.

NOTE: 1949 Ford and Mercury V-8; 1949 Lincoln and 150 h.p. Ford Truck; 1948-49 Ford 6 Cyl.; 1949 Tractor

Valve assemblies in these motors employ conventional valve keepers on the bottom of the valve stem to hold the assembly together. The 1949 Ford V-8 and 6 cyl. motors, 150 h.p. Lincoln and Ford Truck and 1949 Ford Tractor have one-piece, solid guide bushings. Servicing of each is explained separately, further on.

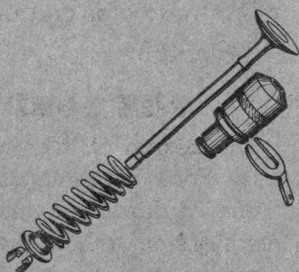


FIGURE 2

REMOVING VALVE ASSEMBLIES

Even after normal use, nearly all valves in Ford motors are stuck tightly in their bores with a formation of hard carbon and motor gums. Because they are so "frozen" they are very difficult to pry either up or down with a conventional bar-type lifter without damage to motor parts or lifter.

K-D Valve Guide Puller Sets are scientifically designed to quickly pull "frozen" valve guide assemblies, no matter how tightly they are stuck . . . and to do the job without damage to costly motor parts or delay to the mechanic.

The design principle employed in the K-D Valve Guide Puller causes the tremendous pressure of a screw to be exerted directly over the point of resistance . . . the pull is straight up. Contrast this to the wasteful action of a pry-bar acting through a fulcrum!

HOW TO PROCEED

Ford V-8 motors to date (except 150 h.p.)

Mercury to date

Lincoln Zephyr

Lincoln (to and including 1948)

Ford 6 cyl. to 1948

Ford Tractor (to and including 1948)

The No. 920 Valve Guide Puller Set, consisting of the No. 917 Valve Guide Retainer Driver and the No. 918 Valve Guide Puller services all of these motors.

Place the No. 917 Driver in the position shown in Fig. 3 with the hook end of the tool engaged in the hole in the guide retainer. Allow the spring retainer (the lower one) to remain in place. Strike the handle of the Driver squarely and firmly but not too hard. Continue driving until retainer is removed. Remember that the retainer rests in a counterbore in the block and must be "forged" out slowly. If the guides are stuck tightly, damage to the guides may result if the first few hammer blows are too hard. (There is a vent hole through LINCOLN-ZEPHYR retainers and to avoid tearing the retainers, weakened by this hole, they must be handled with even more care than those in other Ford motors.) This method for removing retainers will damage the retainers but the time saved more than pays the small cost of new retainers. See K-D 922, Page 20, Figure 36. After the retainers are removed, place the No. 918 Puller in the position shown in Figure 4. The tempered steel jaw plate is placed between the coils of the spring, under the guides. It is notched to fit

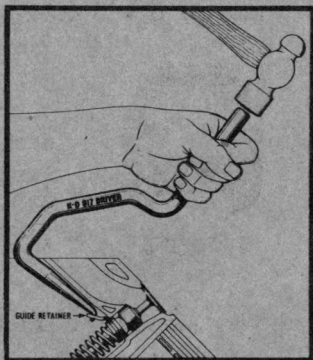


FIGURE 3

around the valve stem. The pressure cup rests on the block casting around the valve head. When the screw handle is turned down the jaw plate bears on the bottom

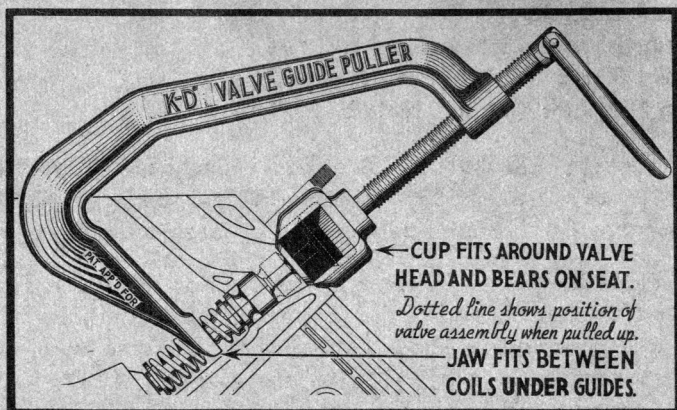


FIGURE 4

of the guides and the assembly is pulled up and out, no matter how tightly it had been stuck. The pressure cup has sufficient internal clearance to allow the valve head to rise inside it as the assembly is pulled up.

NOTE: Ford 6 cyl. motors up to 1948:

In these motors, the intake valves are larger than the exhaust and will not rise inside the pressure cup of the No. 918 Puller. The No. 923 Adaptor is made for these intake valves and must be used on the Puller to service Ford 6 cyl. motors. It is not a part of the No. 920 Valve Guide Puller Set but must be ordered separately. Figure 5.

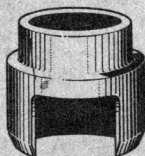


FIGURE 5

★ ★ ★

Ford 6 cyl. and Ford Tractor after 1948

Ford 6 cyl. motors beginning with late 1948 models and 1949 Ford Tractors are built with split keepers. Use K-D

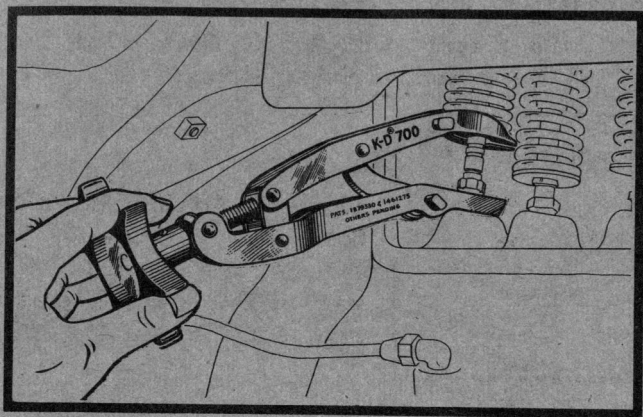


FIGURE 6

No. 700 Valve Spring Lifter to raise spring and remove keepers. (Figure 6.) Adjust jaws to fit spring and tappet by thumbscrew. Turn handwheel to bring jaws together so lifter may be positioned. Place cup shaped upper jaws under spring, lower jaws on tappet block. Turn handwheel clockwise, raising spring to desired height. Tool locks automatically. Remove keepers. Turn handwheel counterclockwise, allowing spring to descend, and proceed to next valve. When keepers are all out remove valves and springs. Reverse operation to replace assemblies. Use K-D No. 608 Valve Keeper Inserter, see page 16.

★ ★ ★

HOW TO PROCEED

1949 Lincoln and 150 h.p. Ford Truck

To service these motors, springs must first be removed before other work can be done on valves and hydraulic tappets. The job is done in two easy steps with the K-D 930 Valve Spring Compressor **and** the K-D 935 Valve Spring Compressor. **Both tools are necessary to do the job.**

FIRST STEP

Raise spring with No. 930 Compressor
and remove keepers



FIGURE 7

Figure 7. Adjust jaws with wing screw to fit valve spring. Next—adjust plunger screw to **line marked 150 h.p.** Compressor is now ready for use.

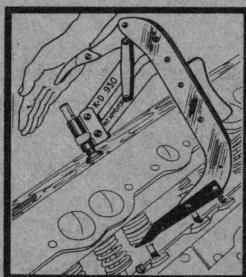


FIGURE 8

Figure 8. Raise operating handle. Place Compressor on motor with lower jaws under the lower spring retainer. Pushing operating handle down raises spring. After keepers are removed, raise operating handle to remove compressor. Proceed to next spring. Do not disturb plunger bar setting.

STEP TWO

Remove spring with No. 935 Compressor

FIGURE 9

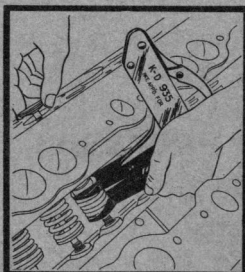
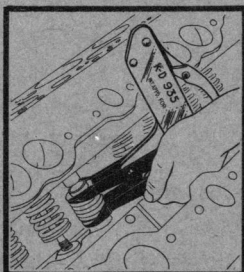


FIGURE 10



Figures 9 and 10. 1. Place upper jaw in position between cylinder casting and upper valve spring retainer;

lower jaws **beneath lower valve spring retainer**. Compress spring by moving operating handle down until it locks in position. Hold compressed spring **up** against cylinder casting, and be **sure** that tappet is not stuck in lower spring retainer before valve is removed. Remove valve. **2.** Valve removed, slide spring down, cocking lower end **toward** you until the inner edge of the lower retainer rests on top of the tappet, at the same time pull toward you, gently, to slide spring out.

TO REPLACE SPRINGS

Reverse previous operation

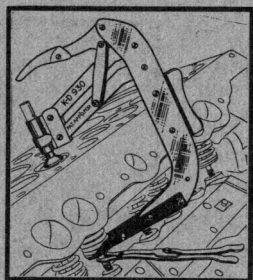


FIGURE 11

Figure 11. Replace spring and valve in motor. Raise spring again with No. 930 Compressor and install keepers on valve stem with self supporting K-D No. 608 Insertter. Raise operating handle of compressor, allowing spring to descend into place. **Note**—K-D 608 services following 150 h.p. Motors: All 1949 Lincoln and Ford

Trucks to engine number 8EQ-27993. To replace keepers on the free-type valves used on engines after No. 8EQ-27993 use K-D No. 609 Magnetic Keeper Insertter. See page 17, Figure 31.

★ ★ ★

HOW TO PROCEED

On Ford V-8-60 (discontinued 1940)

The No. 860 Valve Guide Puller Set, consisting of the No. 862 Driver and the No. 861 Puller is built especially to service Ford V-8-60. With a K-D No. 260 Bar-Type Valve Spring Lifter (see Figure 16) under the end of the valve stem . . . between valve and tappet . . . raise the

valve far enough to permit the insertion of the No. 862 Driver under the valve head as shown in Figure 12. With the Driver holding the valve up, take a secure position under the valve, compressing the spring as much as possible. This will allow the replacing of the Driver as shown in Figure 13, so that when the spring is allowed to relax the valve head will come to rest on the flange of the Driver, as shown in Figure 14. Insert Driver in valve port on side nearest cylinder. Be sure the end of the Driver is resting on both guides so that when struck, guides will be driven down evenly. Striking the handle of the Driver imparts shock directly to the guides, breaking the carbon "freeze" and driving the guides down far enough to permit the removal of the guide retainer . . . **do not** drive down further than necessary. Remove the valve guide retainer, allowing the valve spring retainer (lower one) to remain in place. Raise the spring again and remove the Driver, allowing the valve to reseal. Place the jaw of the 861 Puller between the coils of the spring under the guides with the cup around the valve head, bearing on the block casting as shown in



FIGURE 12



FIGURE 13

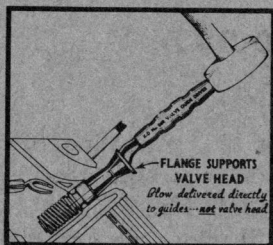
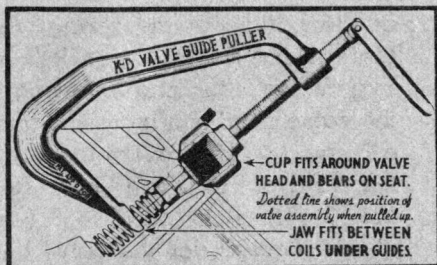


FIGURE 14

Fig. 15. Be sure the cup is not resting on the valve head.

Turn the screw handle which will pull the valve assembly complete without damage or delay. Cup has sufficient internal clearance to allow the valve head to rise inside it as shown in Figure 15.

A generous application of penetrating oil in guide bore around guides will facilitate the operation of this Puller Set.



★ ★ ★

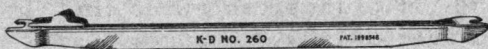
FIGURE 15

NOTE: If the guides should be driven down so far when removing retainer that the Driver cannot be removed, an opening has been provided in the cup to allow the application of the Puller around the Driver. In this case, the Puller jaw will have to be applied to the end of the valve stem instead of under the guides.

★ ★ ★

THE K-D No. 260 Bar-Type Valve Spring Lifter is especially designed for Ford V-8-60 and is ideal for use with the No. 860 Set as just described above. It is made of

FIGURE
16



channel steel, correctly hardened but in no case is it to be used in an attempt to pry out "frozen" valve guides. **The guarantee of the Lifter is voided if so used!** The end of the Lifter with the fulcrum block is used to pry guides down for insertion of valve guide retainer when reassembling the motor.

★ ★ ★

HOW TO PROCEED

Ford V-8-85, Models of 1932 and 1933

The valve-spring-guide assembly in these motors is not the same as in the later models just described. In the '32-'33 models there is only one retainer and it is located

at the bottom of the spring. After raising the valve spring with the K-D No. 245 Bar-Type Valve Lifter, and removing the retainer, the valve head can be raised and the guides driven completely out of the guide bore with the K-D No. 818 Valve Guide Remover, Figure 17. The stem of the No. 818 is sufficiently offset to get under the valve head and deliver a square blow to the guides and it is long enough to drive the guides out of the bore. The end of the tool is large enough to bear generously on both halves of the guides.



FIGURE 17

★ ★ ★

OPTIONAL SERVICING OF INDIVIDUAL VALVES

1949 Ford V-8 and Mercury

Individual valves on these motors can be serviced with K-D. 930 Valve Spring Compressor without removing the entire valve assembly.

Fig. 18. Adjust jaws with wing screw to fit valve spring. Next—adjust plunger screw to **line marked 100 h.p.** Compressor is now ready for use.

Figure 19. Raise operating handle. Place compressor on motor, with lower jaws under the lower spring

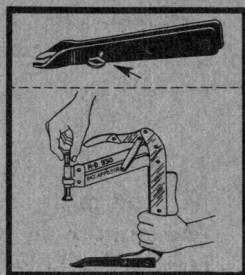


FIGURE 18

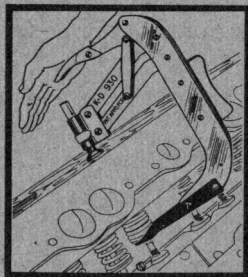


FIGURE 19

retainer. Pushing operating handle down raises spring. After keepers are removed, raise operating handle to remove compressor. Proceed to next spring. Do not disturb plunger bar setting. Reverse operation to replace spring. It is suggested that valve

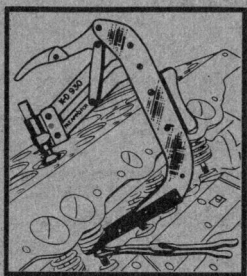


FIGURE 20

to-tappet-clearance be adjusted before keepers are installed. With No. 930 Compressor raise spring to allow use of feeler gauge to measure proper clearance. Install keepers on valve stem with self supporting K-D No. 608 Insertor. Fig. 20. Raise operating handle of compressor, allowing spring to descend into place.

★ ★ ★

DISMANTLING THE VALVE ASSEMBLY

All Ford built motors to date (except '48-'49 6 cyl., '49 Lincoln and 150 h.p. Ford Truck, '49 Tractors).

When all the valve assemblies have been removed from the motor, they can be dismantled with the K-D 930 Valve Spring Compressor. Grip the Compressor in the bench vise. Adjust jaws with wing screw to fit valve spring. Next—adjust plunger screw to line marked 100 h.p. for 1949 Ford and Mercury V-8's. (On earlier models screw plunger bar down as far as it will go.) Compressor is now ready for use. Raise operating handle and place assembly in Compressor as shown in Figure 21. Pushing operating handle down compresses spring, permitting removal of spring retainer (or split keepers in later models). After valves are ground as outlined below, the valve assembly is put together again by reversing the procedure just described.

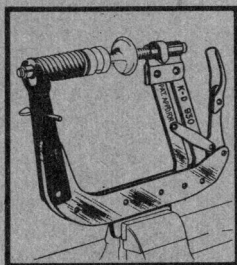


FIGURE 21

GRINDING VALVES

Position of Camshaft

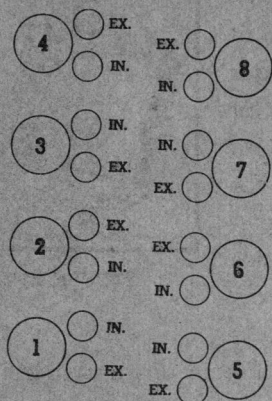
To grind valves and adjust tappet clearances correctly, the camshaft must be in such position that the push rod for each valve rests exactly on the heel of the cam for the valve that is to be ground. The camshaft position is indicated on V-8 motors by the open position of certain combinations of valves. The chart shows the three camshaft positions for Ford V-8 and Mercury motors. Valves can be ground and tappet clearances established

CAMSHAFT POSITION CHART IN V-8 MOTORS	
Valves Open	Valves in Position to Grind
4 ex. and 1 in.	3 ex., 8 in., 6 in., 7 ex., 3 in., 2 ex.
3 ex. and 8 in.	1 ex., 7 in., 5 ex., 2 in., 4 ex., 1 in.
1 ex. and 7 in.	8 ex., 5 in., 6 ex., 4 in.

FIGURE 22

by using this chart in connection with Figure 23 which shows the numbering of the valves and cylinders.

DIAGRAM OF VALVES AND CYLINDERS IN V-8 MOTORS



FRONT OF MOTOR

FIGURE 23

When grinding **Lincoln-Zephyr** valves, turn the crankshaft until one piston is on top dead center of compression stroke, then grind valves and adjust tappet clearances (see page 17, Fig. 32) for the two valves for this cylinder. Follow through on all valves and cylinders after No. 1 in the regular firing order—1, 4, 9, 8, 5, 2, 11, 10, 3, 6, 7, 12.

Follow the same procedure on **Ford 6 cyl.** in the regular firing order—1, 5, 3, 6, 2, 4.

Follow the same procedure on **Ford 4 cyl.** in the regular firing order—1, 2, 4, 3.

VALVE GRINDING BUSHINGS

Because the Valve Guides in Ford motors (except 48-49 Ford 6, 1949 Lincoln and 150 h.p. Ford Truck and 1949 Tractor) do not support themselves in the guide bore, it is necessary to use a valve grinding bushing in place of the guides when grinding valves, and, again when establishing valve to tappet clearances. K-D Valve Grinding Bushings are one piece, accurately machined, with jumper spring attached.

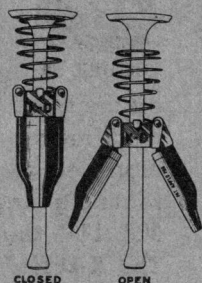


FIGURE 24

When inserting these bushings, the lug at the top of the bushing **must** be in the intake or exhaust port—or the bushing will not seat properly.

The K-D No. 1118 Valve Grinding Bushing is for use in Ford V-8 and Mercury up to 1949, Lincoln-Zephyr, Ford 6 cyl. up to 1948, Ford 4 cyl. and Ford Tractor. This tool is hinged to permit insertion of the mushroom-end valve as shown in Figure 24. Body diameter 1.029".

The K-D No. 1160 Valve Grinding Bushing is for use in Ford V-8-60 motors only. Body diameter .8505"

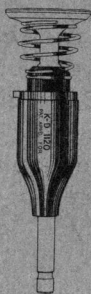


FIGURE 25

The K-D No. 1120 Valve Grinding Bushing is for use in 1949 Ford and Mercury V-8 motors. This tool is a solid, one-piece bushing. The straight end valve is inserted as shown in Figure 25. Body diameter 1.030".

NOTE: 1949 Lincoln and 150 h.p. Ford Truck, 48-49 Ford 6, and 1949 Tractor

All have pressed-in sleeve guides. Valve grind-bushings are not necessary to grind valves and establish clearances in these motors.



VACUUM CUP VALVE GRINDERS

The K-D No. 504 Valve Grinding Attachment (Figure 26) for all Ford Motors except V-8-60. Simplifies the job



FIGURE 26

when using an oscillating type valve grinder, either manual or power driven. Since there is no slot in the Ford valve head, gripping the head is accomplished by a rubber vacuum cup. To keep the cup from slipping off the head while grinding, the 504 has a spring held metal retaining ring. No. 504, $1\frac{3}{8}$ " cup diameter. May also be had **without** the metal retaining ring in No. 507, $1\frac{1}{8}$ " diameter or No. 509, $1\frac{3}{8}$ " diameter.

The K-D No. 503 Vacuum Valve Grinder (Figure 27) is for hand operation on all Ford Motors except V-8-60. In addition to the features of the No. 504, it incorporates a handle flange which keeps the hands from working down the handle while grinding. Cup diameter $1\frac{3}{8}$ ".



FIGURE 27

The K-D No. 865 Vacuum Valve Grinder (Figure 27) is for hand operation on Ford V-8-60 only and is like the No. 503 except in cup diameter, which is $1\frac{1}{16}$ ".

★ ★ ★

FREE TYPE VALVES

To increase exhaust valve life, in Ford 8EQ engines **free-type valve assemblies** have been released for production starting February 9, 1949, with engine No. 8EQ-27993. Successful operation of the free-type valve assembly depends entirely on proper installation. Clearance required between the end of the valve stem and inside depth of the cap is very important. It is controlled two ways:

- A. By the length of the valve stem from its tip end to the face of the undercut which keepers rest on.
- B. By the inside depth of the cap. See Fig. 28.

If the inside cap depth is too shallow, or the length between the undercut and end of valve stem is too long, the cap will not lift the keys and spring, consequently valve will not rotate. On the other hand, if the cap depth is too deep or the length between the undercut and tip is

too short, clearance will be excessive, resulting in a high wear rate between cap and keys, also possible valve breakage.

Servicing and Installing Free-Type Valves in 150 h.p. Ford Trucks

1. Remove valve springs with 930, 935 Compressors as explained on pages 5, 6, and 7.
2. Check valve guides after cleaning out deposits. If bell-mouthed or worn so that clearance is over .020", install new guides.
3. Reface valve seats and check with indicator. (Not to exceed .002 run-out.)
4. Inspect valves to be certain that valve seats and parts have not been nicked in handling and that valves are not warped or burnt.
5. Compress spring and lower spring retainer with No. 935 Compressor.
6. Replace spring and retainer with 935 Compressor. Install valve and place cap on end of valve stem. Let spring down by lifting handle of compressor.
7. To replace large, thin keepers on these free type valves lift the spring with the 930 Compressor, Fig. 29, and install keepers with self supporting K-D No. 609 Magnetic Keeper Inserter (page 17). Lower spring and proceed to next valve.

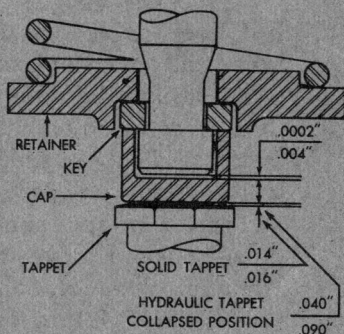
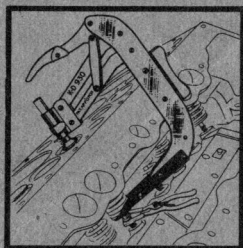


FIGURE 28

FIGURE 29



Check clearance between end of valve stem and inside of Cap. The clearance between valve end and cap can be checked before installing the valve assembly with a special micrometer built for this purpose.

If this micrometer is not available clearance can readily be checked after parts are assembled in the engine as follows: Turn the engine over until the valve is off the seat and can be rotated freely by thumb and forefinger in the lifted position. In this free position the actual clearance can be measured by locating a dial indicator on the valve head and noting the reading when the valve is moved **vertically**. This clearance can be .0002 providing the valve turns freely, but not over .004" maximum vertical movement. If vertical movement exceeds .004", polish open end of cap against a piece of fine emery cloth to bring vertical movement of valve to specified clearance. If vertical movement is less than .0002", grind off end of valve stem to provide clearance.

NOTE: If free valves are used with hydraulic tappets, bleed oil out of hydraulic units by inserting brass wire through the tube to open the check valve and then press down on plunger until it bottoms. Install tappet and valve and check clearance (.040 to .090"). If free valves are used with adjustable tappets adjust screw in tappet until there is .014 to .016" clearance between valve in closed position and tappet when on heel of cam. This applies to exhaust valves only. Intake valves are set at .010 to .012".

★ ★ ★

VALVE KEEPER INSERTERS

K-D No. 608 Valve Keeper Inserter is built to handle the small size split keepers used in later Ford-built motors. Special spring steel fingers on the jaws (Fig. 30) hold keepers securely. Self supporting on valve stem, both hands are free to work the compressor. When spring is lowered keepers are caught in correct alignment on valve stem; inserter is pushed off. Tool 8 3/16" long.

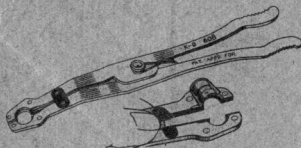


FIGURE 30

The K-D No. 609 Magnetic Valve Keeper Inserter was especially designed to handle the large diameter, thin keepers used in free type valves on Ford 150 h.p. Trucks.

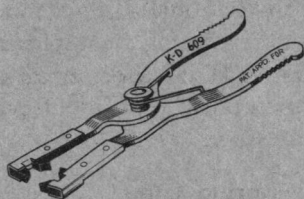


FIGURE 31

Only $4\frac{1}{2}$ " long, keepers are quickly aligned on the small jaw magnets Fig. 31. Self supporting on the valve stem. This tool is also very handy for picking out keepers that drop into the valley when lifting springs.

VALVE STEM TO TAPPET CLEARANCE

It is absolutely essential that these clearances be accurately established to turn out a smoothly idling motor. To establish them it will be necessary to grind off the end of the valve stem. For this purpose, the maker of your valve refacer can furnish the necessary micrometer depth gage and a grinding adaptor for your refacer. This equipment is necessary because stems must be ground square and parallel or valve noises will develop. The information on camshaft positions on page 12 will be found helpful.

Recommended Valve to Tappet Clearances

FIGURE
32

	Intake	Exhaust
Ford V-8 1942 to date	.010" to .012"	.014" to .016"
Ford Trucks 1937-1947	.010" to .012"	.014" to .016"
Ford 150 h.p. Trucks 1948 on	See note	See note
Ford 4 cyl.	.010" to .012"	.014" to .016"
Ford 6 cyl. to date	.013" to .015"	.013" to .015"
Ford 60 h.p.	.011" to .012"	.011" to .012"
Ford all others	.011" to .012"	.011" to .012"
L-Z 1936 and 1937	.0125" to .0135"	.0125" to .0135"
L-Z 1938-1942*	0"	0"
Lincoln 1949*	0"	0"
Mercury 1942 to date	.010" to .012"	.014" to .016"
Mercury 1941 trucks	.010" to .012"	.014" to .016"
Mercury all others	.010" to .012"	.011" to .012"

* These models have hydraulic valve lifters and there is no clearance when measured with lifter full of oil. Measured without oil in the hydraulic unit, there should always be .030" to .070" clearance between valve stem and top of plunger. The plunger should fit free.

It is also important in hydraulic lifter jobs that correct oil pressures be maintained. They are measured at the plug above the metering hole and should be 8 to 10 lbs. at idling speed.

NOTE: Up to Engine No. 8EQ-27993 Ford 150 h.p. trucks were equipped with hydraulic valve lifters. Valve clearance is 0". Beginning with Engine No. 8EQ-27993 these trucks are equipped with free type valve assemblies and adjustable tappets. Clearance on Intake valves .010" to .012"; Exhaust valves .014" to .016".

REPLACING VALVE ASSEMBLIES

Ford V-8 and Mercury motors are so constructed that the valve assemblies can be replaced with a bar-type valve spring lifter. Illustrated here are two such lifters made by K-D. **CAUTION:** These lifters are made for **replacing** valve assemblies only and must **NOT** be used in an attempt to remove valve guide assemblies. Manufacturer's guarantee is void if they are so used.

The K-D No. 245 Bar-Type Valve Spring Lifter

Ideal companion tool to 920 Set (Page 3, 4) for replacing retainers on all Ford V-8 and Mercury motors. Forged from solid steel bar stock, correctly designed and prop-

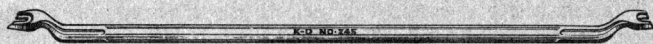


FIGURE 33

erly tempered, the No. 245 has identical jaws on each end. It is 30 inches long, weighs 4 pounds, and with proper use should last a lifetime. **NOT** to be used for prying out "frozen" valve guides.

The K-D No. 250 Bar-Type Valve Spring Lifter

For all models Ford V-8 and Mercury since 1932. Large jaw for '32 and '33 models; small jaw with fulcrum for later models. A good value at low price. Fig. 34.

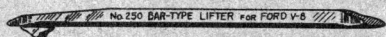


FIGURE 34

PROCEDURE

Ford V-8 and Mercury Motors:

After the guide bores have been cleaned, valves ground and tappet clearances established, reassemble valve spring and guides as described on page 11. Drop assemblies into guide bores. On motors with split guides be sure the split between the guides runs crosswise. This is important so that each half of the guides is gripped by the jaw of the bar-type lifter when pulled down for installation of the guide retainer.

Insert the jaw of the bar-type lifter between the coils of the valve spring, engaging the shoulder which is cast at the bottom of the guides, described on page 1. Raising up on the handle of the lifter will pull the guide down permitting the installation of the valve guide retainer.

*** * * NOTE * * ***

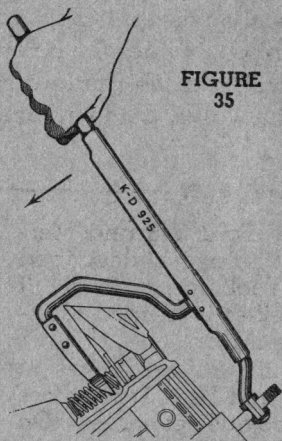
Assemblies can be replaced in Ford V-8 and Mercury motors with either a Bar Lifter as just described OR the K-D No. 925 Replacing Tool, pages 19, 20. If you have the No. 925, no Bar Lifter is needed to install valves in V-8 or Mercury motors.

Bar Lifters can **NOT** be used to replace valves in Lincoln-Zephyr, Ford 6, Ford 4 and Ford Tractor because there is no "heel" to provide leverage. On these motors **ONLY** the K-D No. 925 will install assemblies. See page 20 and chart on page 30.

Lincoln-Zephyr, Ford 6 cyl. (to late 1948), Ford 4 cyl., and Ford Tractor (to 1949) motors, because of their construction, require a special tool for the installation of valve guide retainers. The tool is the K-D No. 925 Valve Guide Replacing Tool. It is strongly made for dependable service when used for **replacing** assemblies **only**. (It must not be used in an attempt to remove "frozen" assemblies and the manufacturer's guarantee is void if it is so used.)

After guide bores are clean, valves are ground and tappet clearances are established, reassemble valve, spring and guides (described on page 11) and drop assemblies into guide bores with split between guides running cross-wise in the motor. This is important so that each half of the guides is gripped by the No. 925 when being pulled down for installation of guide retainer.

Engage link on the end of the tool on one of the head studs as shown in Figure 35 with the jaw between the coils of the spring engaged on the shoulder cast on the end of the guides. A downward pressure on the handle



**FIGURE
35**

pulls the guides down, permitting the installation of the guide retainer. The handle on the No. 925 is short enough to service the Ford 6 cyl. and the Ford 4 cyl. motors conveniently and has a rod extension (shown in use) for extra leverage where working space permits.

Ford V-8-60 valve assemblies are replaced with the K-D No. 260 Bar Type Lifter described on page 9. After guide bores are clean, valves are ground and tappet clearances are established, reas-

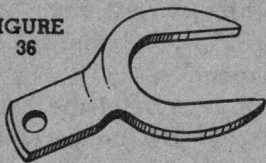
semble valve, spring and guides, and drop assemblies into bores with split between guides running crosswise in the motor. This is important so that each half of the guides is gripped by the lifter when being pulled down for the installation of the guide retainer.

Insert the jaw of the No. 260 between the coils of the valve spring with the fulcrum block turned up and engage the jaw on the shoulder which is cast on the bottom of the guides, described on page 1. Lifting up the handle of the lifter will cause the fulcrum to bear on the block casting, pulling the guides down and permitting the installation of the valve guide retainer.

K-D Replacement Retainers

In removing retainers with the K-D 917 Valve Guide Driver, they are "forged" out and bent beyond salvaging. (See page 3.) Time saved in this operation more than pays the small cost of new retainers. K-D No. 922 Replacement Valve Guide Retainers fit Ford V-8, Mercury, Ford 6 cyl., Ford 4 cyl. and Tractor. No. 921 fits Lincoln-Zephyr only.

**FIGURE
36**



REASSEMBLING THE ENGINE

ELIMINATING VALVE NOISES:

Before starting to reassemble the engine, examine and correct any of the following. They may cause noisy and inefficient valve action.

1. ROUGH PUSH RODS. After long service the cam end of the push rod may become worn and uneven. Be sure to examine **both** ends of the push rod and if wear is beyond repair, replace the rod.

2. VALVE ENDS NOT GROUND SQUARE. When the ends of the valves are not ground square in establishing tappet clearances the high side will cut through the oil film between the valve and the tappet and produce a "tap" on each lift.

3. COCKED GUIDE RETAINER. When inserting valve guide retainers on models with split guides, be sure the retainer engages in the slot of both halves of the guide. If it does not, the one half of the guide may move up and down with the valve and produce noise.

4. VALVE STEM TO GUIDE CLEARANCE. No more than .004" clearance is permissible between the valve stem and the guides. Poor performance and excessive oil consumption will result from "sloppy" guides. Recommended clearance: .0015"-.0035", intake; .0025" to .0045" exhaust, on V-8s. On 6 cyl.—.0015" to .0035" intake and exhaust.

5. COLLAPSED VALVE SPRINGS. When valve springs have collapsed more than $\frac{1}{8}$ " in service they should be replaced by new springs. Springs whose ends are out of square should also be replaced. Correct valve spring pressures are as follows:

Ford V-8, Mercury, Ford 6, Ford 4 and Ford Tractor motors, 36 to 40 lbs. at 2.125"; Lincoln-Zephyr, 51 to 57 lbs. at 2.125"; 1949 Lincoln 62 to 68 lbs. at 2.08".

GASKETS

Cylinder head gaskets must be installed with the end marked "Front" to the front of the motor. Both banks of cylinders use the same size and shape gasket in V-type motors.

CYLINDER HEAD NUTS

The correct order for tightening cylinder head nuts is an important step in reassembling the motor. Care must be taken or wrinkled gaskets and distorted heads will result. Tighten the nuts in the order shown in Figures 37, 38, 39.

Ford and Mercury Motors V-8 Engines. Passenger 1937 to date, Trucks 1937-1947. (Fig. 37.)

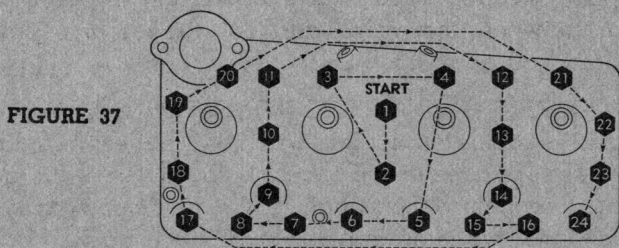


FIGURE 37

Torques

Head nuts (cast iron heads to 1949) 50-60 ft. lbs.

Head nuts (aluminum heads) 35-40 ft. lbs.

Head nuts 1949—45-50 ft. lbs.

Ford V-8-60 (aluminum heads)—30 ft. lbs.

1949 Lincoln and 150 h.p. Ford Trucks (48-49) (Fig. 38)

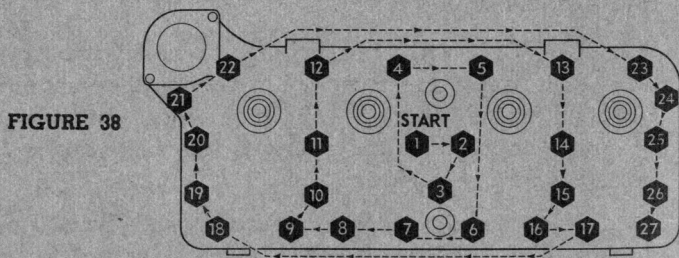
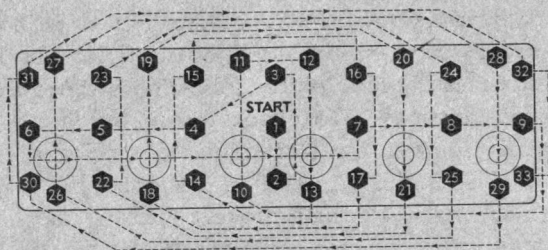


FIGURE 38

Torque: Head nuts—50-55 ft. lbs.

Ford 6 cyl. (Fig. 39)

FIGURE
39



Torque

Head nuts 1941-47: 50-60 ft. lbs.

Head nuts '48 to date: 45-50 ft. lbs.

First run the nuts down "against" and then retrace in proper order at least twice, each time drawing them down a little tighter. For best results the use of a pressure indicating wrench is recommended but even with this wrench, by all means do not run any nut down tight the first time around.

HEAD NUT PRESSURES

After the gaskets have compressed, cylinder head nuts should be tightened **again** . . . when engine is warm . . . to prevent distortion of wall, head and valve seats, failure of gaskets, loss of compression and poor performance. Check again after engine has been allowed to cool. Use a torque indicating wrench and tighten to pressures given above.

VALVE TIMING

TIMING GEAR MARKS

There is a straight mark on the camshaft gear which must line up with a small round punch mark on the crankshaft gear. When these marks line up the timing gears will function correctly. On 1949 Ford V-8 and Mercury the mark appears on the crankshaft pulley. On 1949 Lincoln and 150 h.p. Ford Trucks it is on the torsion damper. If a timing light is available, best results are gained by using it.

HOW TO CHECK VALVE TIMING

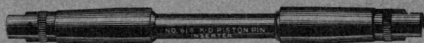
It is recommended that a timing light or standard, recognized motor tune-up stand be used for this job. When neither is available the following procedure will time gears correctly. To check the timing gears with valve action, remove the starting motor and crank the engine until Piston No. 1 (see diagram page 12) is at top dead center of the exhaust stroke. Place a mark on the flywheel and a corresponding mark on the housing. Turn the flywheel counterclockwise until the intake valve is closed and then turn it slowly clockwise until the intake valve just starts to open. If the intake valve just starts to open approximately three flywheel teeth past your mark on the housing, you will know the gear timing is correct.

★ ★ ★

OTHER TIME-SAVING K-D TOOLS

PISTON PIN INSERTERS

FIGURE 40



This tool is designed for use on pins using an expanding ring lock, centrally-located. The tapered end of the tool spreads the lock ring in the connecting rod so the pin can be entered and when the groove in the pin engages the lock ring in the rod the Inserter is removed. Made of hardened tool steel, ground for accuracy. No. 618 for early models Ford V-8-85 and Lincoln Zephyr. No. 617 for 1949 Ford and Mercury V-8s.

K-D No. 77 FAN BELT FLIPPER

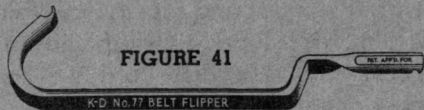


FIGURE 41

A convenient tool for removing and replacing fan belts in a safe way . . . without disturbing pulley adjustments on Ford built motors. The straight end is used to **remove**

belts by placing the tool between the belt and the pulley with the straight end resting on the hub of the pulley or on the fan shaft. Raise the belt out of the pulley and slide it off the shoulder just above the straight end with a sidewise prying motion. To **replace** belts, place the curved end of the Flipper between the belt and the pulley with the milled slot at the end of the belt upside down so that its widest edge rests in the curve of the tool and turning the tool quickly towards the flange of the pulley, the belt flips off the tool and into the flange of the pulley.

K-D No. 875 PISTON RINGER

An ideal tool for removing and installing piston rings of all sizes and styles up to 4" dia. and is especially helpful in handling the delicate oil rings used in Ford motors. The ring is gripped as shown in Figure 42 with the spread-



FIGURE 42

ing jaws in the ring opening. When the spreading handles are compressed the ring is expanded and its removal or installation simplified. Because of accurate "feel" in the hands of the operator, the ring can be expanded just enough to permit installation or removal . . . and stretched rings can be avoided. It's a great finger saver, too.

K-D No. 800 WHEEL PULLER SET

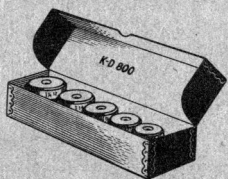


FIGURE 43

K-D Hammer-type wheel pullers are made for quick and easy removal of wheel hubs without damage to axles. Made from alloy steel, in all axle sizes, in both long and short types. K-D No. 800 Set is a convenient general shop package, containing the five most popular sizes in the short type puller, shown in Figure 43. One each $\frac{5}{8}$ " x 18, $\frac{3}{4}$ " x 16, $\frac{7}{8}$ " x 14, 1" x 14, and 1 $\frac{1}{4}$ " x 12. Sturdy fibreboard box with metal corners.

K-D No. 870 PISTON RING FILER

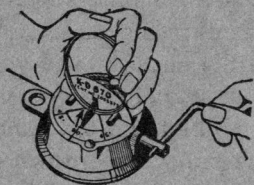


FIGURE 44

square against gage. 6" continuous cutting stroke. Saw teeth on edge useful in slotting pistons and for many other rotary hack saw operations.



FIG. 45

872 Cutter-Files for replacement in 870 are milled to maximum sharpness and correctly tempered for satisfactory service. (Figure 45.)

K-D No. 115 IGNITION POINT ALIGNING TOOL

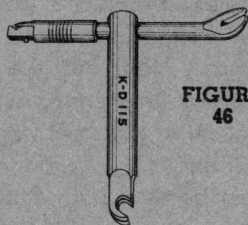


FIGURE 46

This universal tool aligns both stationary and breaker arm points in all types of distributors, in most cases without removing distributor from its mounting. End with sliding sleeve for high-speed arms. Forked end for channel-type arms. Milled and slotted end for stationary points. See operation in Fig. 48.

K-D IGNITION KITS

The K-D 120 Ignition Kit (Fig. 47)

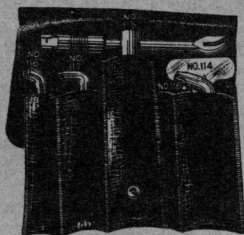


FIGURE 47

This kit contains a complete set of tools to make all types of ignition adjustments on Ford Distributors and Voltage Regulators quickly and accurately. It contains the K-D No. 114 Ford Governor Spring Adjusting Wrench; the No. 115 Ignition Point Aligning Tool explained

above; No. 116 Autolite and Delco Voltage Regulator tool; No. 117 Offset Screwdriver for Ford V-8 Ignition Point Clamping Screws; No. 118 Ford Voltage Regulator Tool. Tools are packed in a handy, pocket size plastic kit, 4 15/16" wide x 4 5/8" folded. Figure 48 shows the application of each tool.

The K-D 119 Ignition Kit contains all the tools of the 120 kit **except** the 115 Ignition Point Aligning Tool. Packed in a smaller, pocket size plastic kit. 3 1/2" wide x 4 1/2" folded.

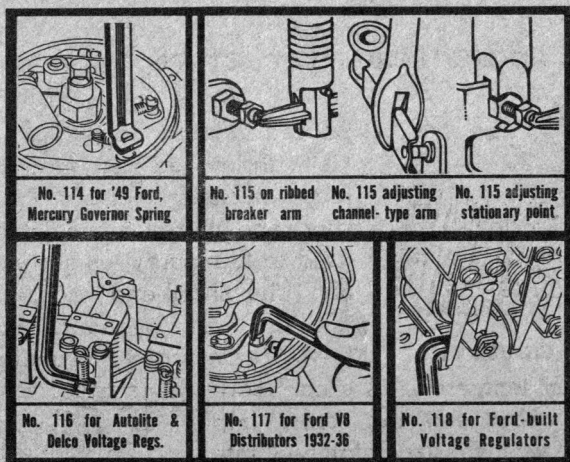


FIGURE 48

No. 10K PLIERS SET (Fig. 49)

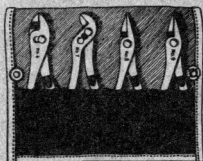


FIGURE 49

Carefully designed, alloy steel pliers for a variety of small jobs. Four distinct types of jaws: standard nose with slip joint; parrot nose with slip joint; needle nose and flat nose. Forged steel, jaws milled, handles knurled. All tempered to correct hardness. Each 4 1/4" long. Tools are packed in a handy pocket size roll. Ideal for small jobs in tight places.

★ ★ ★

No. 20 RATCHET WRENCH SET (Fig. 50)

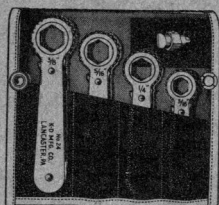


FIGURE 50

Four popular hex sizes, $\frac{3}{8}$ ", $\frac{7}{16}$ ", $\frac{1}{2}$ " and $\frac{9}{16}$ " openings put up in a pocket size fabric roll. Includes double end screwdriver bit to fit the $\frac{3}{8}$ " wrench. Each wrench is a complete unit, with no heads to change. Ratchet teeth are close to permit short stroke. Reversible ratchet, boxsocket construction. Sizes 3" to $4\frac{1}{2}$ " long. Correctly tempered.

No. 30 SOCKET SCREW KEY SET (Fig. 51)

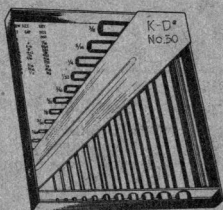


FIGURE 51

11 hex keys, sizes .050" to $\frac{3}{8}$ ", packed in a handy rust-proof metal kit with hinged retaining clamp—plus—extension handle to use on short end of key when long end is used to turn screw as shown in Fig. 52. The short end of the key fits into the hole in end of extension. Keys are accurately forged and correctly tempered. A quick reading chart, showing screw, cap and wrench sizes stamped into the container. The set is ideal for work bench and toolbox. $5\frac{3}{8}$ " wide x $5\frac{3}{4}$ " high.

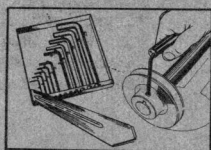
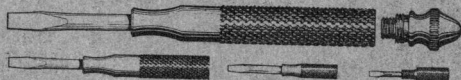


FIGURE 52

No. 5D 4-IN-ONE SCREWDRIVER (Fig. 53)

FIGURE 53

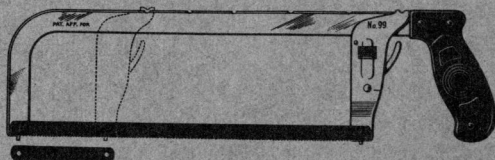


A brass screwdriver with fluted handle. 3 smaller screwdrivers encased in the handle. A very handy tool for the toolbox. $6\frac{1}{8}$ " long.



No. 99 CONVERTIBLE HACKSAW FRAME (Fig. 54)

FIGURE 54



This frame "cuts around corners" and spans obstructions and projections with short blades installed. (Figs. 55, 56.) All steel frame with stops for 3", 4½", 6", 8", 10", 12" blades. Blades quickly changed or repositioned by releasing lever on tension bar, installing new blade, resetting lever. Backbone and handle are integral providing great strength and rigidity. No loose parts; frame cannot "jackknife." Comfortable grip.

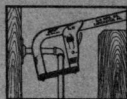


FIGURE 55

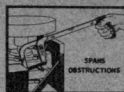
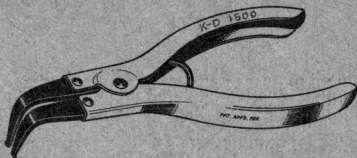


FIGURE 56

No. 1500 TIRE PROBING TOOL (Fig. 57)

FIGURE 57



Spreads cuts in tire treads for easy removal of imbedded foreign bodies. No danger of cutting or mutilating tire. Tool is inserted lengthwise into cut, turned at right angles.

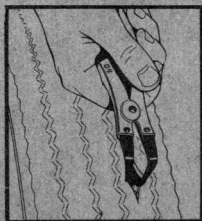


FIGURE 58

Opening jaws spreads cut exposing any imbedded object. (Fig. 58.) Pry out with any pointed instrument or grip with the serrated inside face of the 1500 and lift it out. Removal of wheel unnecessary if car is on lift. Sturdy, all steel construction. Rustproof finish. 6" long.



THE CORRECT K-D TOOL COMBINATIONS

For removing and replacing valves in all Ford-built motors

MOTOR	TO REMOVE	PAGE	REPLACE	PAGE
8 Cyl., 1932-33	245 Lifter 818 Driver	10 10	145 Lifter	18
8 cyl. all other (except 60 and 150 h.p.)	920 Set	3	245 Lifter 925 Repl.	18 19
8 Cyl. 1949 (Optional service, individual valves)	930 Compressor	10	930 Compressor 608 Insertor	10 16
8 Cyl. 60 h.p.	860 Set	7	260 Lifter	9
8 Cyl. 150 h.p.	930 Compressor	5	935 Compressor	7
Truck and 1949 Lincoln	935 Compressor	5	930 Compressor 608 Insertor	7 16
Lincoln-Zephyr	920 Set	3	925 Repl.	19
6 Cyl. Up to 1948	920 Set with 923 Adaptor	4	925 Repl.	19
6 Cyl. after 1948	700 Lifter	4	700 Lifter 608 Insertor	5 16
4 Cyl. (late), and Tractor to 1949	920 Set	3	925 Repl.	19
1949 Tractor	700 Lifter	4	700 Lifter 608 Insertor	5 16
4 Cyl. Model A-B	307 Lifter 502 Driver	— —	307 Lifter	—

Your Jobber's Salesman will be glad to give you prices
and any other information on

K-D TOOLS

"The Hustlers for Your Toolbox"

or if you write to us at Lancaster, Pa., and mention your
jobber's name, we will be pleased to send you FREE our
latest complete catalog.